RESD3V3BAED

Ultra-Low Capacitance ESD Protection Diode / TVS

Datasheet

V_{RWM}	3.3	V
C_t	0.22	pF

●Features

1) Bidirectional ESD Protection for 1 Line
2) Ultra-Low Capacitance: 0.22 pF (Typical)
3) Low ESD Clamping Voltage
4) IEC61000-4-2 Level 4 ESD Protection
5) Ultra-Low Leakage Current: 10 nA (Maximum)
6) Ultra-Small SMD Package (0.60×0.30×0.28)

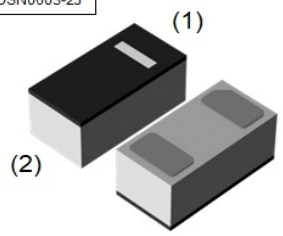
●Applications

・End Equipment
- Computing: Notebooks, Desktops and Servers
- Mobile Devices: Smartphones, Tablets and Wearables
- Consumer Electronics: TVs and Monitors
- Peripherals: USB dongles, Docking Stations

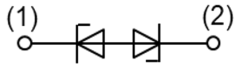
・Interfaces
- USB4®
- USB 3.x
- Thunderbolt™ 4
- HDMI™
- DisplayPort™
- PCI Express®
- Antenna

●Outline

Package Code	SOD-962
JEITA Code	-
ROHM Code	DSN0603-2J



●Inner Circuit



(1) IO1
(2) IO2

●Packaging Specification

Packing	Embossed Tape
Reel Size (mm)	180
Taping Width (mm)	8
Quantity (pcs)	15000
Taping Code	B15R
Marking	13

USB4® is a registered trademark of USB Implementers Forum (USB-IF).

Thunderbolt™ is a trademark of Inter Corporation.

HDMI™ is a trademark of HDMI Licensing LLC.

DisplayPort™ is a trademark of VESA.

PCI Express® is a registered trademark of PCI-SIG.

●Absolute Maximum Rating (T_a = 25°C unless otherwise stated)

PARAMETER	SYMBOL	CONDITIONS		MIN	MAX	UNIT
Peak pulse current	I_{PPM}	t_p = 8/20 μs		-	±6	A
Operating junction temperature	T_j	-		-	150	°C
Storage temperature	T_{stg}	-		-55	150	°C
Electrostatic discharge voltage	V_{ESD}	IEC61000-4-2*1	Air	-	±15	kV
			Contact	-	±13	kV

*1 C = 150 pF, R = 330 Ω

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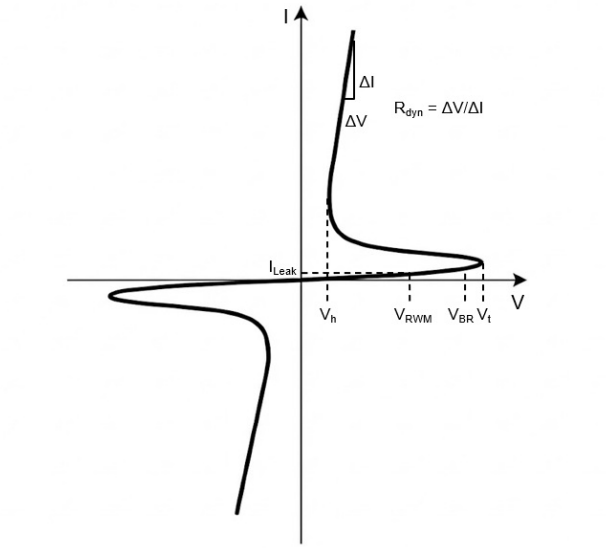
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●Characteristics (T_a = 25℃ unless otherwise stated)

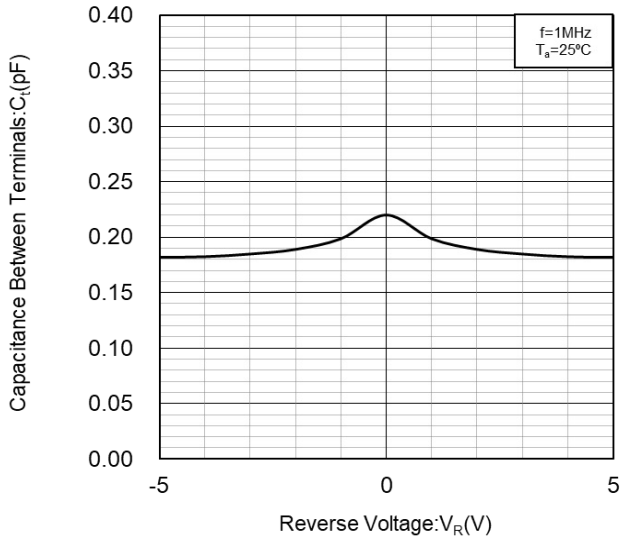
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Reverse stand-off voltage	V_{RWM}	-	-3.3	-	3.3	V
Breakdown voltage	V_{BR}	I_{IO} = ±1 mA	±8.0	±9.0	-	V
Hold voltage	V_h	TLP*2	-	±2.5	-	V
Clamping voltage	V_{CL}	I_{pp} = ±8 A, TLP*2	-	±6.0	-	V
		I_{pp} = ±16 A, TLP*2	-	±9.0	-	V
Leakage current	I_{Leak}	V_{RWM} = ±3.3 V	-	0.1	10	nA
Capacitance between terminals	C_t	f = 1 MHz, V_R = 0 V	-	0.22	0.30	pF
Dynamic resistance	R_{dyn}	I_{pp} = ±10 A, TLP*2	-	0.28	-	Ω

*2 TLP (Transmission Line Pulse) t_p=100ns; square pulse

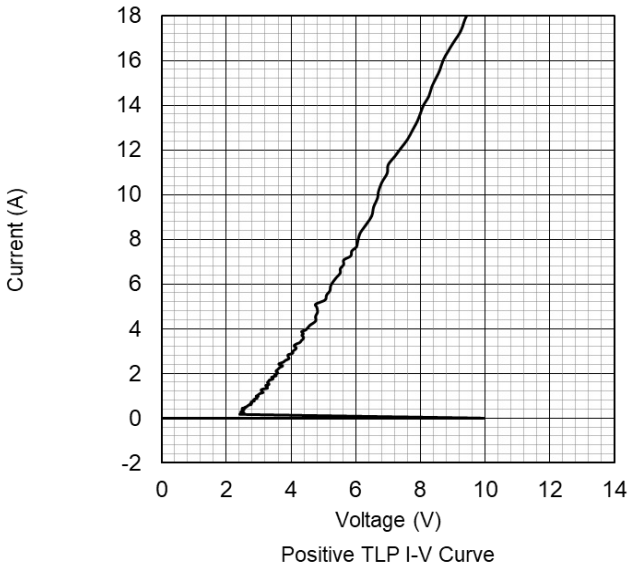
●Characteristic Curves



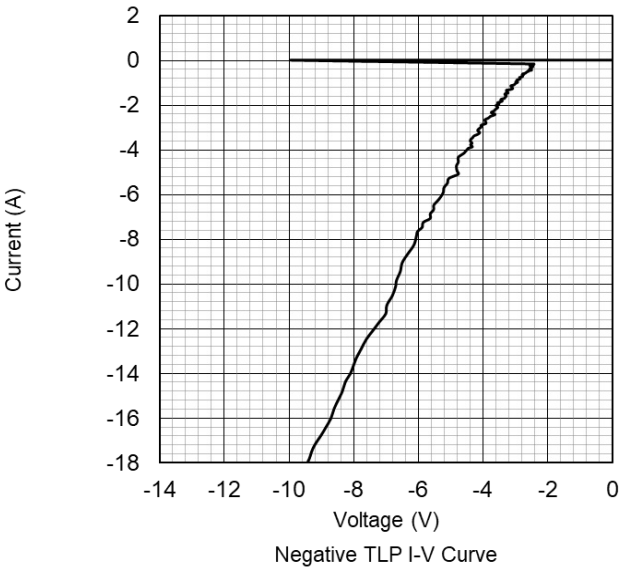
I-V characteristics for a bidirectional ESD protection diode



V_R-C_t Characteristics



Positive TLP I-V Curve

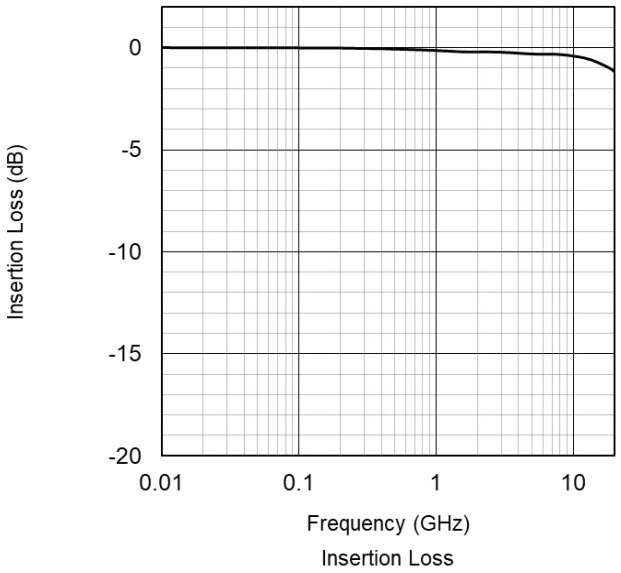


Negative TLP I-V Curve

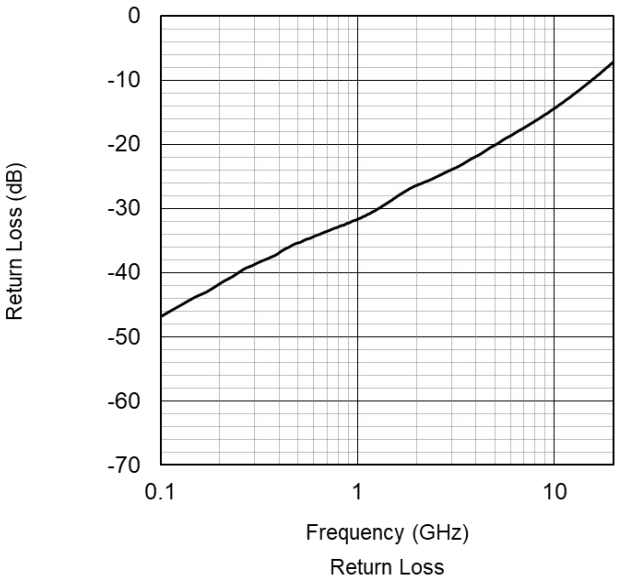
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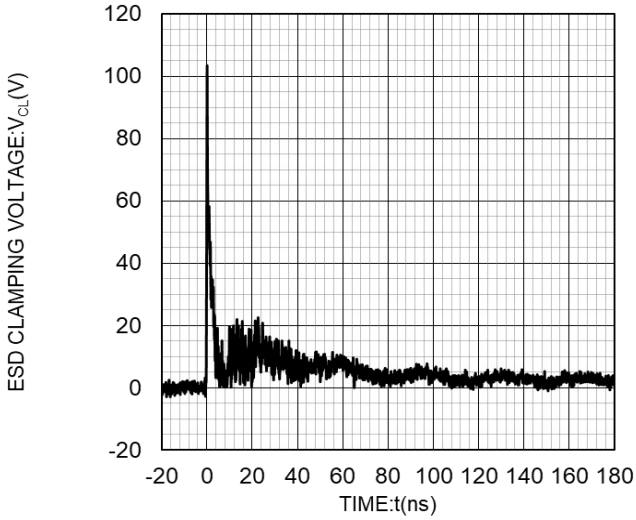
●Characteristic Curves



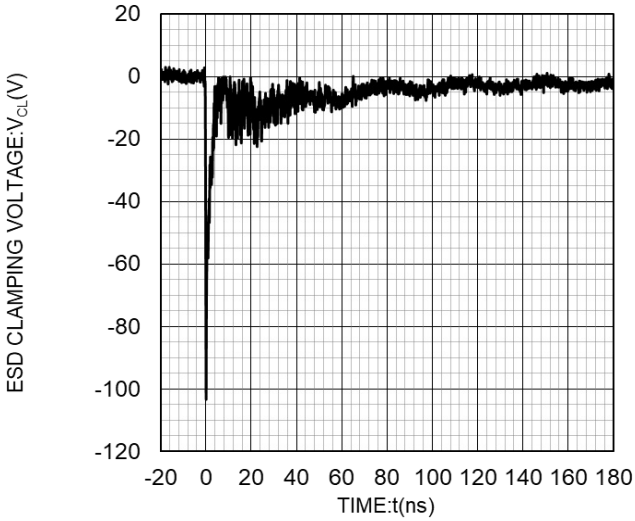
Insertion Loss



Return Loss



ESD Clamping Voltage Waveform
(IEC61000-4-2 +8kV Contact)

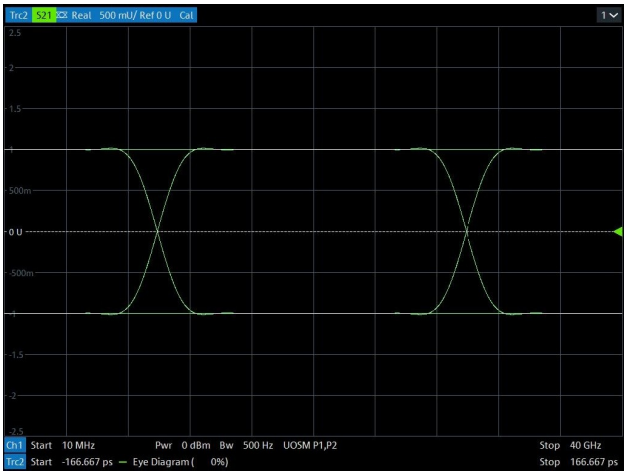


ESD Clamping Voltage Waveform
(IEC61000-4-2 -8kV Contact)

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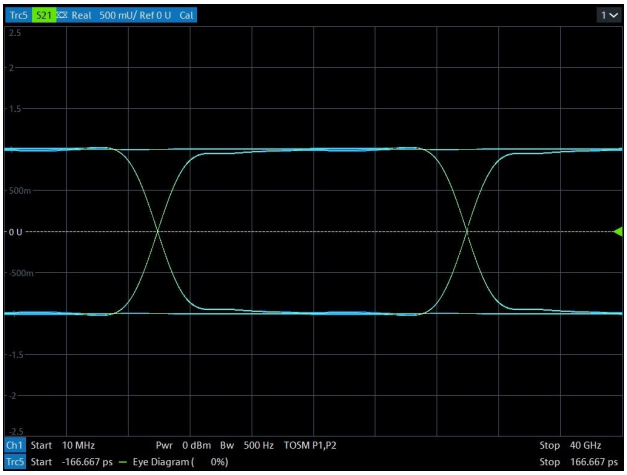
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●Characteristic Curves



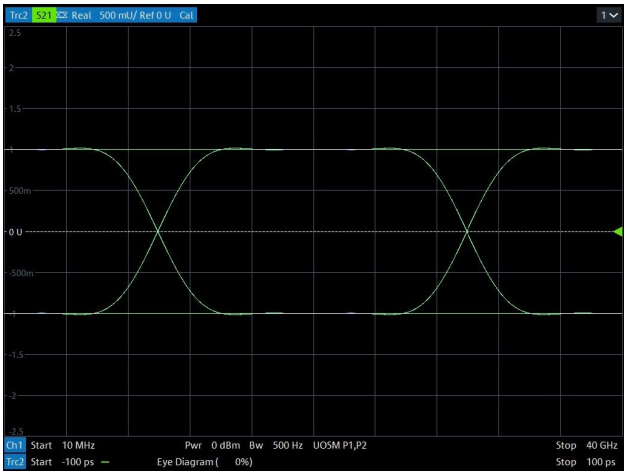
Data Rate > 6 Gbps Eye Diagram

(Bare board)



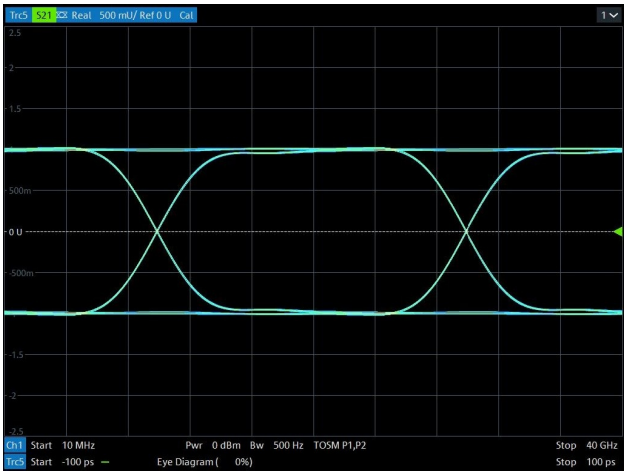
Data Rate > 6 Gbps Eye Diagram

(with RESD3V3BAED)



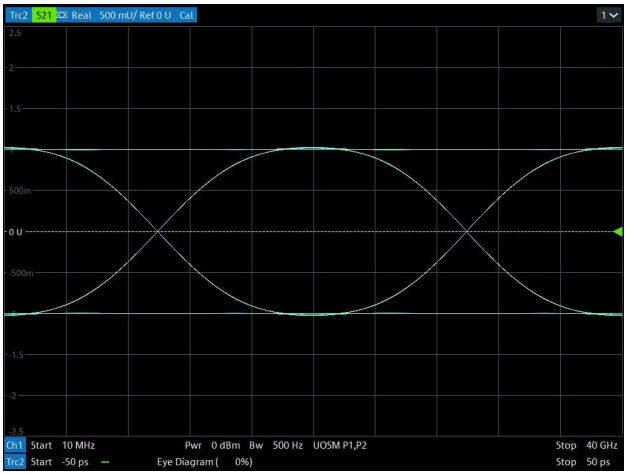
Data Rate > 10 Gbps Eye Diagram

(Bare board)



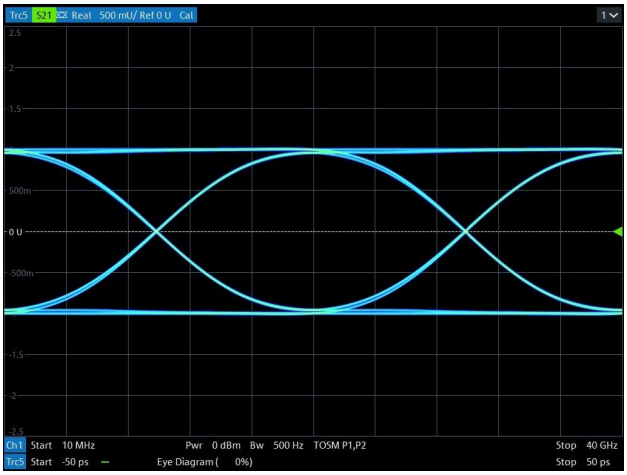
Data Rate > 10 Gbps Eye Diagram

(with RESD3V3BAED)



Data Rate > 20 Gbps Eye Diagram

(Bare board)



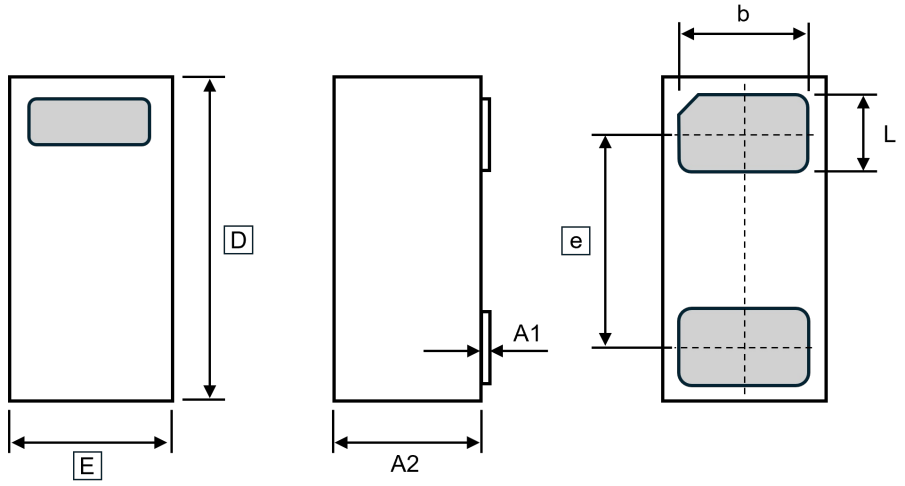
Data Rate > 20 Gbps Eye Diagram

(with RESD3V3BAED)

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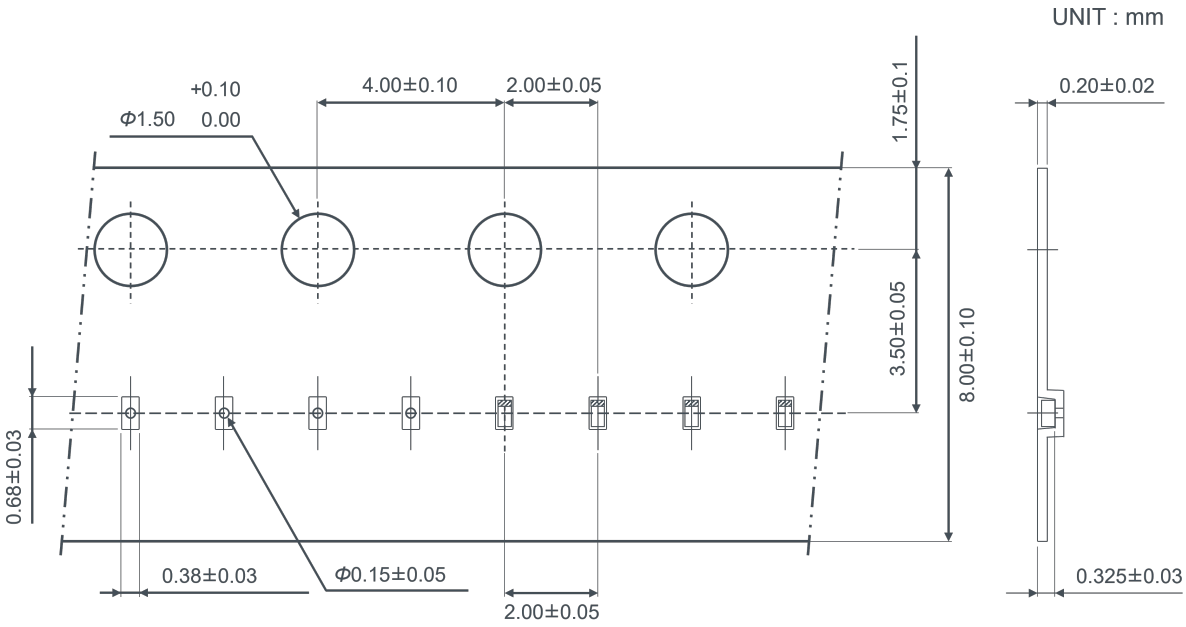
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●Dimensions (SOD-962 DSN0603-2J)



DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A1	-	0.01	-	-	0.0004	-
A2	0.26	0.28	0.30	0.0102	0.0110	0.0119
b	0.21	0.24	0.27	0.0082	0.0094	0.0107
D	0.55	0.60	0.65	0.0216	0.0236	0.0256
E	0.25	0.30	0.35	0.0098	0.0120	0.0138
e	-	0.40	-	-	0.0157	-
L	0.12	0.14	0.16	0.0047	0.0055	0.0063

●Taping (Unit:mm)



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1. Our Products are designed and manufactured for application in ordinary electronic equipment (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment (Note 1), transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.

(Note1) Medical Equipment Classification of the Specific Applications

JAPAN	USA	EU	CHINA
CLASSⅢ	CLASSⅢ	CLASSⅡb	CLASSⅢ
CLASSⅣ		CLASSⅢ	

2. ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
   [a] Installation of protection circuits or other protective devices to improve system safety
   [b] Installation of redundant circuits to reduce the impact of single or multiple circuit failure

3. Our Products are designed and manufactured for use under standard conditions and not under any special or extraordinary environments or conditions, as exemplified below. Accordingly, ROHM shall not be in any way responsible or liable for any damages, expenses or losses arising from the use of any ROHM's Products under any special or extraordinary environments or conditions. If you intend to use our Products under any special or extraordinary environments or conditions (as exemplified below), your independent verification and confirmation of product performance, reliability, etc, prior to use, must be necessary:
   [a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
   [b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
   [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
   [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
   [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
   [f] Sealing or coating our Products with resin or other coating materials
   [g] Use of our Products without cleaning residue of flux (Exclude cases where no-clean type fluxes is used. However, recommend sufficiently about the residue.) ; or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
   [h] Use of the Products in places subject to dew condensation

4. The Products are not subject to radiation-proof design.

5. Please verify and confirm characteristics of the final or mounted products in using the Products.

6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse, is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.

7. De-rate Power Dissipation depending on ambient temperature. When used in sealed area, confirm that it is the use in the range that does not exceed the maximum junction temperature.

8. Confirm that operation temperature is within the specified range described in the product specification.

9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

Precaution for Mounting / Circuit board design

1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.

2. In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

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Precautions Regarding Application Examples and External Circuits

1. If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.

2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
   - [a] the Products are exposed to sea winds or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
   - [b] the temperature or humidity exceeds those recommended by ROHM
   - [c] the Products are exposed to direct sunshine or condensation
   - [d] the Products are exposed to high Electrostatic

2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.

3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

Precaution for Product Label

A two-dimensional barcode printed on ROHM Products label is for ROHM's internal use only.

Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

Precaution for Foreign Exchange and Foreign Trade act

Since concerned goods might be fallen under listed items of export control prescribed by Foreign exchange and Foreign trade act, please consult with ROHM in case of export.

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